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**QISU** collects and analyses data from emergency department injury presentations on behalf of Queensland Health. Participating hospitals represent urban, rural and remote areas of Queensland.

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#### QISU STAFF:

##### Director

Dr Ruth Barker

##### Manager

**QISU and Queensland Safe Communities Support Centre**

Debbie Scott

##### Assistant Manager

Linda Horth

##### Medical Staff

Dr Ruth Barker

Staff Specialist, ED Mater Children's Hospital

##### QISU Fellow

Dr Nobu Inoue

##### Data / Web / IT Projects Officer

Goshad Nand

##### Hospital Project Coordinator

Michelle Hillcoat-Schardt

##### Coding Officers

Patricia Smith, Linda Horth

##### Administration Officer

Desi Castillo

##### Bulletin Layout

Patricia Smith

##### Contact QISU:

##### QISU

Mater Health Services

Level 1 Whitty Building

Raymond Terrace

South Brisbane QLD 4101

**Phone:** 07 3163 8569

**Facsimile:** 07 3163 1684

**Email:** [mail@qisu.org.au](mailto:mail@qisu.org.au)

**Website:** [www.qisu.org.au](http://www.qisu.org.au)

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# INJURY BULLETIN

## Tip Over Injuries in Children under 5 years of age in Queensland, 1999-2008

Dr Nobu Inoue, Dr Ruth Baker, Debbie Scott

### Summary of Findings

- \* Furniture and appliance related injuries in children under 5 years of age accounts for an estimated 180 emergency presentations annually in Queensland
- \* Injuries occur when children push or pull items over, climb and fall off furniture, or climb and tip the item over
- \* Children under 2 years of age tend to injure themselves by pulling items over onto themselves
- \* Children over 2 years of age are more likely to be injured after climbing the item and either falling off or tipping the item over onto themselves
- \* Tip over injuries (where the item falls over and injures the child) in children under 5 years of age account for an estimated 115 emergency presentations annually in Queensland.
- \* The item most commonly associated with a tip over injury is a television (with or without the cabinet)
- \* Prevention requires better design and selection of furniture with inherent stability coupled with mechanisms to install or fix less stable items

### Introduction

In 2007, the US Consumer Product Safety Commission (CPSC) listed tip-over injuries together with magnets, recalled hazardous toys, blinds and spa drains among five hidden home dangers [1]. Of these, tip-over injuries have proven to be the most hazardous with 22 deaths, on average, per year in the United States [1]. In a 2008 report, the CPSC estimated that emergency departments treated 42,700 furniture and television instability and tip-over injuries for 2006 [2].

In Australia, a hospital-based study conducted between 2000 and 2003 in the two large paediatric hospitals in Sydney reviewed 52 furniture-related injuries. The study found that these injuries were most common in young children (median age 2.5 years) and that a falling TV was the most common cause. [3].

This edition of the bulletin will describe the pattern of furniture/ appliance-related tip-over injuries to children under 5 years of age in Queensland.

## Method

QISU data is collected at triage in participating emergency departments throughout Queensland. This data is representative of approximately one quarter of emergency presentations in Queensland. The QISU database was searched for the 10 year period, January 1999 to December 2008 for all furniture/ appliance related injuries. Data were extracted using major injury factor codes to identify all types of furniture and appliances. There were 11,988 cases extracted.

Extracted cases were reviewed by individually reading text descriptions to identify injuries associated with furniture or appliance tip-over. A common precipitant for tip over injury is a child climbing on or swinging from furniture. Therefore we included injuries associated with this mechanism in the report and have reported on them separately to other injuries. We excluded items of furniture that would normally be used for sitting on, sleeping on or sitting at (e.g. beds, sofas, chairs, tables). These furniture items tend to be more inherently stable. The usual injury pattern with these items is a child climbing and falling off the item. Bunk beds pose a significant injury risk due to the height of the fall from the upper bunk, and have occasionally been reported to collapse. This topic has been dealt with in an earlier bulletin (Bulletin 103).

There were 499 cases identified in the QISU data where the injury mechanism was either due to a tip over event or the child was injured having fallen from the item within the cases definition. Analysis was conducted on this dataset. Cases where a specific tip-over event was identified have been further analysed.

The National Coroners Information System (NCIS) database was accessed in September 2009 and cases that were closed to coronial inquiries were searched for deaths of children under 5 years of age that were related to furniture or appliance tip over injuries in Australia [4].

## Results

### Death Data

The NCIS database revealed 12 deaths in children less than 5 years of age related to furniture tip-over injury in Australia between 2000 and 2009. In addition, there were two cases where a child died after being caught in furniture (a drawer and a reclining chair). Of the 14 cases identified, 8 were male and 6 female. The majority of children (64%) were aged less than 2 years, the youngest being 11 months. Furniture items included cupboards, TVs, cabinets, chest of drawers, wardrobes and a lamp. Four cases involved televisions, (in 2 cases the TV cabinet tipped and the TV and cabinet fell on the child). Of the 12 tip-over injury deaths, the child climbed up or in the furniture item in three cases, and in five

cases, the furniture item was unstable enough to be bumped or pushed over or tip when drawers were opened. One child died after pulling a cord on a lamp and having the lamp fall onto them. In the remaining three cases, it is unclear how the item came to fall on the child. The majority of fatalities related to tip-over injuries were due to or associated with a head injury.

## QISU Data

### Age and Gender

There were a total of 449 cases identified as furniture/appliance related injuries according to our case definition between 1999 and 2008. The male-to-female ratio was 3 to 2 (269 cases to 180 cases). Injuries occurred most often in children aged between one and three years of age (68.5%; n=342) with a median age of 2.2 years (Table 1).

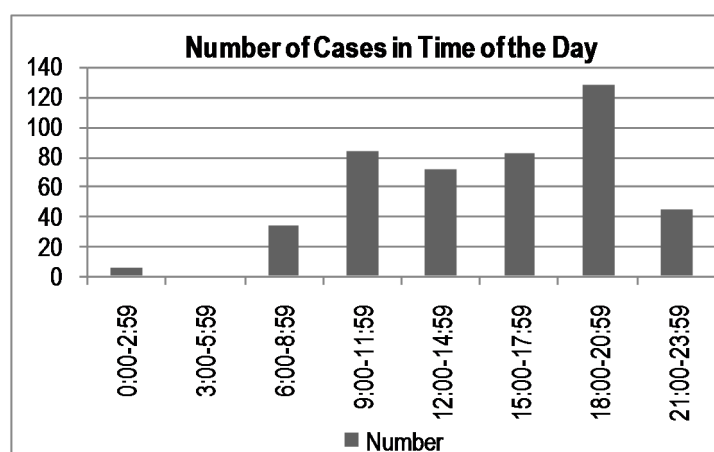
Table 1: Furniture/Appliance related Injury by age and gender: n = 449

Age (year)	Male	Female	Total
0	20	17	37
1	68	48	116
2	85	49	134
3	56	36	92
4	40	30	70
Total	269	180	449

### Time of Injury

The majority of injuries occurred in the evening, between 6pm and 9pm (28.5%; n=128) (Figure 1). There was no specific pattern with regard to the day of week or month for furniture/ appliance-related injuries.

Figure 1. Furniture/Appliance related Injury by Time of the Day: n = 449



### Furniture/ Appliances

Items that caused injuries to children were divided into four categories as follows: storage items (including cabinet or cupboard, chest of drawers, chest, bookshelf, and wardrobe), entertainment items (including TV (with or without cabinet), stereo including speaker, DVD or video player, and

computer), kitchen items and white goods (including refrigerator and/or freezer, washing machine, microwave, oven, stove and dishwasher), and others (including mirror, telephone, air conditioner).

The largest proportion of furniture/ appliance-related injuries were due to storage items (250 cases; 55.7%) followed by entertainment items (161 cases; 35.9%) (Table 2).

The most common single item that caused furniture-related injuries was a TV with or without a cabinet (31.2%; n=140) followed by a cabinet or cupboard (30.3%; n=136), chest of drawers (12.6%; n=57), and a bookcase (7.1%; n=32). Three quarters of all furniture-related injuries were caused by these four items (Table 2).

Table 2. Furniture/ appliance items involved in injuries: n = 449

Items	Total	Items	Total
Storage		Kitchen/White Goods	
Cabinet/Cupboard	136	Fridge/Freezer	9
Chest of Drawers	57	Washing Machine	3
Bookcase	32	Dishwasher	2
Shelves	12	Stove	2
Wardrobe	10	Microwave	1
Chest	3		
<b>Total</b>	<b>250</b>	<b>Total</b>	<b>17</b>
Entertainment		Others	
TV (with/without Cabinet)	140	Mirror	10
Stereo/Speaker	13	Telephone	4
DVD/VCR	4	Heater	1
Radio	2	Unspecified	5
<b>Total</b>	<b>161</b>	<b>Total</b>	<b>21</b>

### Mechanism of Injury

Overall, the most common mechanism of injury involved items falling onto children (66.6%, n=299) (Table 3). In 92 cases, the child either climbed and fell off the item, or climbed and jumped off.

Of the 299 cases where the item fell on the child, we were unable to determine the cause for the item falling/ tipping over in 55.5% (n =166). In the 133 cases where the cause was stated, the most common mechanism was that the item was pulled over onto the child (32.4%, n= 97) or the child climbed the item and it toppled onto them (8.4%, n= 25) (Table 3). In 9 cases, items (mostly drawers or smaller TVs) were dropped onto the child's foot. In 2 cases, the items fell off the wall (a shelf and a wall mounted speaker). There were 58 cases where the mechanism of injury was identifiable using mechanism of injury codes but the text provided no further detail about the injury. These cases were a mixture of "falls" or "struck by or collision with object".

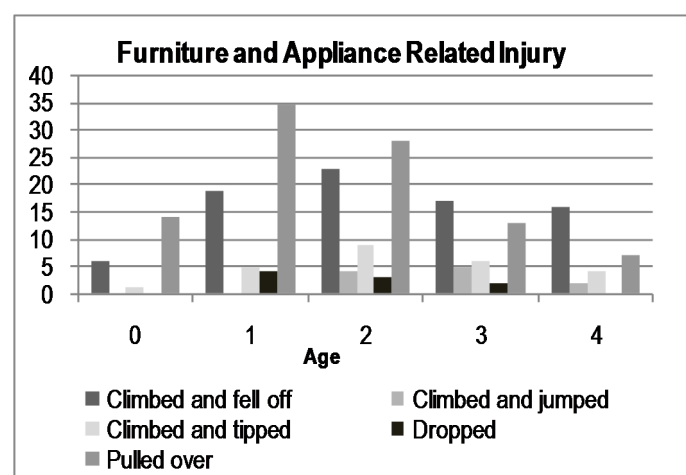
Table 3. Injury Mechanism for Furniture and Appliance Related Injury: n = 449

Type of Injury	Total
Tipped over	166
Pulled over	97
Climbed and tipped	25
Climbed and fell off	81
Climbed and jumped	11
Dropped	9
Fell off wall	2
Unspecified	58
<b>Total</b>	<b>449</b>

### Activity of Child

Excluding cases where the item fell off the wall or the mechanism was not able to be determined (unspecified and item tipped but cause unclear), there were 223 cases where the activity of the child prior to the injury is well described. Figure 2 describes the age of the child and the child's activity prior to the injury event. The majority of injuries in children less than 2 years of age were caused by the child pulling the item down onto themselves. For children 2 years and over, the injury was most commonly preceded by the child's climbing the item.

Figure 2: Furniture and Appliance Related Injury by Child's activity prior to injury and age of child: n=223



### Type of Injuries

The most common type of injury was a superficial injury such as contusion or abrasion (27.6%; n=124) followed by lacerations (23.1%, n=104 cases). Intracranial injuries were the third most common injury (16%, n=72). Head injuries accounted for 226 cases (50.3%) with 64 superficial head injuries, 84 lacerations to the head, and 6 skull fractures seen in addition to the intracranial injuries. (Table 4) There was one case where dropping a TV resulted in amputated toes.

Type of Injuries	Total	Subtype	Total
<b>Superficial injuries</b>	124		
		Head	64
		Upp. ext	8
		Low. ext	32
		Others	20
<b>Laceration</b>	104		
		Head	84
		Upp. ext	5
		Low. ext	12
		Others	3
<b>Intracranial injuries</b>	72		
<b>Fracture</b>	57		
		Head	6
		Upp. ext	27
		Low. ext	24
<b>Sprain</b>	32		
<b>Crushing injuries</b>	29		
<b>Dislocation</b>	2		
<b>Dental injuries</b>	1		
<b>Amputation</b>	1		
<b>No injury identified</b>	3		
<b>Unspecified</b>	24		
<b>Total</b>	<b>449</b>		

Table 4. Nature and Body Region of furniture/ appliance related injuries: n = 449

### Location

The majority of injuries occurred at a home (95.7%, n=430). These injuries occurred most commonly in the bedroom, living room/ dining room, and family room (67.7%, n=338). There were 8 cases that occurred at a child care/ pre-school facility and 11 cases that occurred at a retail facility.

### Severity of Injury

Triage Level	Total
<b>Resuscitation</b>	3
<b>Emergency</b>	20
<b>Urgent</b>	113
<b>Semi urgent</b>	282
<b>Non urgent</b>	27
<b>Unspecified</b>	4
<b>Total</b>	<b>449</b>

Table 5: Triage category for all furniture/ appliance related injuries, n = 449

The majority of cases (62.8%, n=282) were triaged as semi-urgent (i.e. to be seen within 60 min) of arrival to the ED. There were 23 children (5.1%) who were triaged as emergency or above requiring immediate attention or attention within 10 minutes (Table 5). There was no clear

Item	Resuscitation (immediate)	Emergency (10 mins)	Total
Bookcase	1	4	5
Cabinet/ cupboard	1	7	8
Chest of drawers		2	2
Shelves		1	1
Television	1	5	6
Wardrobe		1	1
<b>Total</b>	<b>3</b>	<b>20</b>	<b>23</b>

relationship between the age of the child or furniture/ appliance item and triage category (Table 6).

Table 6. Triage Categories and Items: n = 23

The three injured children who required resuscitation all sustained head injuries due to being struck by falling furniture/ appliances.

The majority (81.5%, n=366) of the injured children were discharged from the ED. Seventy-five children (16.7%) required admission or transfer to another facility for further treatment. Head injury

Place of Injury	Admitted	Transfer to another hospital	Total
Abdomen	1		1
Genital	1		1
Head/Face	40	4	44
Lower back	2		2
Lower extremities	10		10
Multiple	1		1
Neck	1		1
Upper extremities	14	1	15
<b>Total</b>	<b>70</b>	<b>5</b>	<b>75</b>

accounted for 44 (58.6%) of the 75 children who were admitted or transferred (Table 7).

Table 7. Injured Children Required Higher Level of Care and Injured Body Region

Table 8. Furniture/ appliance Item and Nature of Injury for “Tip-Over” Injuries

	Tipped Over Mechanism unspecified	Pulled Over	Climbed and Tipped	Total
<b>Storage</b>				
Cabinet/ cupboard	37	9	7	53
Chest of drawers	17	9	6	32
Bookcase	16	5	2	23
Shelves	4	1	1	6
Wardrobe	5	1	0	6
Chest	1	0	0	1
<b>Entertainment</b>				
Television (with/without Cabinet)	65	48	6	128
Stereo/ speakers	5	6	0	11
DVD/ VCR	3	1	0	4
Computer	2	0	0	2
Radio	1	1	0	2
<b>Kitchen/White Goods</b>				
Fridge/ freezer	0	1	0	1
Dishwasher	2	0	0	2
Stove/ oven	1	1	0	2
<b>Others</b>				
Mirror	4	6	0	10
Telephone	1	3	0	4
Heater	0	1	0	1
<b>Total</b>	<b>166</b>	<b>97</b>	<b>25</b>	<b>288</b>

Table 9: Nature of injury by furniture/ appliance item, n = 288

	Superficial	Intracranial Injury	Laceration	Fracture	Sprain/ Strain	Crushing Injury	Amputation	No Injury	Un-specified	Total
<b>Storage</b>										
Cabinet/ cupboard	18	12	10	6	2	2	0	1	2	53
Chest of Drawers	11	6	5	2	1	4	0	0	3	32
Bookcase	5	4	8	2	2	2	0	0	0	23
Shelves	1	0	2	0	0	0	0	1	2	6
Wardrobe	2	0	0	1	0	1	0	0	2	6
Chest	1	0	0	0	0	0	0	0	0	1
<b>Entertainment</b>										
TV (with/without	45	17	8	16	20	16	1	0	5	128
Stereo/ speakers	5	3	3	0	0	0	0	0	0	11
DVD/ VCR	4	0	0	0	0	0	0	0	0	4
Computer	0	0	0	0	0	1	0	0	1	2
Radio	1	0	1	0	0	0	0	0	0	2
<b>Kitchen</b>										
Fridge/ freezer	0	0	0	1	0	0	0	0	0	1
Dishwasher	1	0	0	0	1	0	0	0	0	2
Stove/ oven	0	2	0	0	0	0	0	0	0	2
<b>Others</b>										
Mirror	3	3	4	0	0	0	0	0	0	10
Telephone	0	2	1	0	0	0	0	0	1	4
Heater	0	0	0	1	0	0	0	0	0	1
<b>Total</b>	<b>97</b>	<b>49</b>	<b>42</b>	<b>29</b>	<b>26</b>	<b>26</b>	<b>1</b>	<b>2</b>	<b>16</b>	<b>288</b>

involving cabinets/ cupboards (22.6%, n = 12), followed by TV (with or without cabinet) (13.3%, n = 17). Intracranial injury also predominated for items where few injuries were recorded (37% for stereo/ speaker, mirror, oven/ stove and telephone combined, n = 10) (Table 9).

The body region most commonly affected in a tipover injury was the head and/or neck (49.3%, n=142), with TVs (with or without the cabinet) accounting for 44 in that group (30.9%).

## Discussion

In this bulletin, we have described the pattern of injury associated with a subgroup of household furniture and appliances. We have selected items that are not designed to be climbed, sat at or on or slept on. Those items that are usually “fixed” (such as dishwashers and ovens) are uncommon in this dataset, yet have potential to tip/ fall if not secured. Others items are less likely to tip because of their wide base or low centre of gravity (i.e. fridges or freezers). Most other furniture and appliance items are moveable and are generally freestanding.

We have described varying injury mechanisms for a wide range of household items. QISU data revealed 449 cases over the last 10 years (an average of 45 cases per year). Assuming QISU data is representative of approximately one quarter of Queensland emergency department presentations, we estimate that there are approximately 180 cases of furniture/ appliance related injury in Queensland children less than 5 years of age annually.

The current consumer trend towards larger wall mounted flat screen televisions has raised concerns amongst injury prevention advocates



that these items may fall when inadequately mounted. In our data, only 2 of the 449 cases involved an item falling off a wall mounting (a shelf and a speaker). We have also described 4 cases where household items that are usually “fixed” have tipped and injured a child (2 dishwashers and 2 stoves). Additional data from the Royal Children’s Hospital burns database shows that burns associated with tipping stoves account for between 1 and 4 presentations to that unit annually with a mean age of 30 months (personal communication). The mechanism usually involves weight being placed on the open oven door and the child either making contact with the open door, or being scalded by liquid contents of falling pots.

We have described injuries due to children climbing and falling or jumping off furniture and appliances, as this activity can be a pre-cursor to tip-over injuries. Analysis of cases where the child’s activity prior to the injury event is known reveals that for children under 2 years of age, the predominant precipitant factor is the child pulling an item onto themselves. In children over 2 years of age, injuries associated with climbing and falling or climbing and tipping items over becomes increasingly common. These injuries are most likely to occur between 6 and 9 PM.

The pattern of furniture/ appliance tip-over injury described in this bulletin is in keeping with reports from other authors [1-5], with a median age of 2 years and a 3:2 male predominance. Televisions are the single most common household item associated with tip-over injury. In the CPSC report into tip-over injuries [2], televisions alone accounted for 62 of the 180 reported fatalities in the 5 year period, with an additional 25 fatalities due to falling televisions and furniture (48% of all tip-over fatalities). In our data, televisions with or without the cabinet accounted for nearly half of all of all identified tip-over injuries (44.4%, n=128).

Head injury was associated with the majority of furniture/ appliance related fatalities identified in the NCIS database. In some cases the children sustained multiple injuries. In our series, head injury was the most common injury in admitted patients and was seen in half of all tipover injuries. There was no significant relationship between head injury and the mechanism of injury, furniture/ appliance involved.

Currently, there are no Australian Standards relating to furniture stability. A draft standard (AS/NZS 4935 ‘Domestic furniture – Free-standing chests of drawers, wardrobes and bookshelves/bookcases – Determination of Stability’) that contains a performance test to assess stability of free standing chests of drawers or cupboards is currently under development by Standards Australia. Australian product safety units are working to provide education to consumers about the potential dangers of furniture tip over injury to young children. One recommendation will be that swing tags on bookcases, cupboards and chests of drawers at point of sale will advise consumers about the dangers of allowing children to climb on furniture, and that hardware to fix furniture to a wall should be made readily available to consumers.

This hardware ideally, should be included in the purchase of the furniture or available at point of sale for those who wish to use it. Manufacturers could also employ furniture designs that consider stability and safety, or at the very least, incorporate methods of fixing furniture to walls in the actual design of the furniture, thereby, removing the need to supply additional ‘kits’ as add ons.

## Recommendations

When choosing furniture for the home, ensure that it is stable:

- \* Check the furniture in the shop BEFORE you take it home
- \* Chests of drawers, filing cabinets and storage units should remain upright even with drawers open
- \* Open drawers and apply a little pressure to ensure the item is stable and the drawers won’t fall out easily
- \* Purchasing furniture with wide bases relative to their height will provide more stability
- \* Heavy or large televisions should be fastened to the wall behind them or placed far enough back on furniture to ensure they are out of reach of a small child
- \* Wall mounted televisions, stereos and speakers should be mounted on appropriate weight rated brackets and attached to a solid structure within the wall (e.g. a stud)
- \* Appliances and cords need to be kept beyond the reach of a small child.

Any furniture item taller than a metre should be fastened to the wall behind it with angle braces, anchors or wall studs to ensure the item is stable. Children should be discouraged from climbing, jumping or playing on furniture. The use of child resistant locks on cupboards and drawers where possible will stop small children from using them as steps to climb on furniture. Placing items of interest to a child on top of furniture (bottles, favourite toys, and remote controls) invites a child to climb in order to reach them. Keep these items on lower level furniture within easy reach of the child, or where necessary to store away from the child, in a locked cupboard [5].

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